DEPARTMENT OF
ECOLOGY
State of Washington

Area Designation Recommendation

1-Hour 2010 Sulfur Dioxide
National Ambient Air Quality Standard

April 2017
Public Review Draft

Publication and Contact Information

This report is available on the Department of Ecology's website at
http://www.ecy.wa.gov/programs/air/sips/pollutants/NAAQs_SO2.htm

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Area Designation Recommendation

1-Hour 2010 Sulfur Dioxide
National Ambient Air Quality Standard

Air Quality Program
Washington State Department of Ecology
Olympia, Washington

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Acknowledgements

The following people participated in the development of this document:

- Anya Caudill
- Ranil Dhammapala
- Alan Newman
- Jason Alberich
- Nancy Pritchett
- Chris Hanlon-Meyer
- Judy Schwieters
- Lisa Kean
- Kim Allen

Executive Summary

The U.S. Environmental Protection Agency (EPA) established the one-hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) on June 3, 2010. The new standard allows for adequate protection of public health including children, the elderly, and those with asthma. An area meets the standard if the 99th percentile of daily maximum one-hour concentrations, averaged over three years, is below 75 parts per billion (ppb).

States can assess levels of SO_2 in ambient air using a monitoring or modeling approach. States must provide the assessment results to the EPA. Based on the results, we can recommend whether each area of the state is in attainment (meets the standard), nonattainment (does not meet the standard), or unclassifiable (insufficient information to determine).

In this document, Ecology proposes to update its earlier (2011) recommendation to designate all areas of the state as unclassifiable. The updated recommendation includes:

- Designating Lewis and Thurston counties as attainment based on modeling and emissions data.
- Withdrawing the 2011 recommendation to designate Chelan, Douglas, and Whatcom counties as unclassifiable. Ecology will provide its recommendation to the EPA in 2020 after we collect sufficient monitoring data.
- Designating the remaining 34 counties as attainment/unclassifiable based on available emissions inventory data, absence of large SO_2 facilities, and high likelihood of the areas attaining the standard.

If an area is designated as attainment or unclassifiable, the area can continue to rely on existing permitting programs and control strategies to maintain healthy air. If an area is designated nonattainment, state must come up with a plan of how to bring the area back into attainment. This plan often requires existing facilities to install additional air pollution prevention controls or change their practices to emit fewer pollutants. It can also require new facilities to implement controls achieving the Lowest Achievable Emission Rate for the pollutant of concern.

The EPA provided states with guidance on area designations for the 2010 SO_2 standard. The EPA also held workshops, conference calls, and offered technical support to states. The EPA will consider states' recommendations and hold a public comment period before finalizing each area's designation.

The responsibility to submit Washington's recommendation to the EPA lies with the Director of the Washington State Department of Ecology (Ecology). The Director acts as the Governor's designee for developing and submitting air quality plans and designation recommendations.

2011 Air Quality Designation Recommendation and EPA SO_2 Data Requirements Rule

In 2011, Washington recommended to EPA to designate all areas of the state as "unclassifiable" for the 2010 SO_2 standard (Appendix A. 2011 Area Designation Recommendation Letter). At that time, Ecology did not have sufficient ambient air quality data to support SO_2 attainment designations. The EPA has not acted on the 2011 recommendation. Instead, in August 2016, the EPA finalized a new SO_2 Data Requirements Rule[1]. This rule clarified how states were to characterize levels of SO_2 in the ambient air in order to determine the area's attainment status.

Under the rule, Ecology identified large facilities emitting 2,000 tons (four million pounds) or more of SO_2 emissions a year. The EPA did not require additional SO_2 investigations in the areas where there were no SO_2 sources, or cluster of sources, emitting above the 2,000 tons threshold.

SO_2 Designations Schedule Consent Decree

The federal Clean Air Act requires the EPA to designate the areas within two years of revising or issuing a new NAAQS. In 2013, Sierra Club and the Natural Resource Defense Council filed a lawsuit mandating the EPA to finalize area designations for the 2010 SO_2 NAAQS. In March 2015, the Court entered the consent decree and issued an enforceable order for the EPA to complete the area designations. The EPA must complete the designations on a schedule that contains three specific deadlines. Only two of them apply to Washington:

1) December 31, 2017.
2) December 31, 2020.

The December 31, 2017, deadline applies to 36 counties in Washington. These counties meet the following criteria:

a) Do not have sufficient monitoring data, and either
b) Do not have facilities that emit 2,000 tons or more of SO_2 emissions a year, or
c) Modeling data characterizes levels of SO2 around large facilities (2,000 tons and more).

The December 31, 2020, deadline applies to areas with large facilities (that emit above 2,000 tons of SO_2 emissions a year), where the state elects to use a monitoring approach. In Washington, this applies to two aluminum smelters, one located on the border between Chelan and Douglas counties and the other located in Whatcom County. The monitoring equipment began operation by January 1, 2017 as required in 40 CFR 51.1203(c)(2). We will use the collected data to characterize the air quality around the facilities. Once we collect and analyze

[1] https://www.epa.gov/so2-pollution/final-data-requirements-rule-2010-1-hour-sulfur-dioxide-so2-primary-national-ambient

three years of monitoring data (2017-2019), Ecology will propose a recommendation on how to designate these three counties. In the meantime, Ecology withdraws its 2011 recommendation to designate Chelan, Douglas, and Whatcom counties as unclassifiable.

Identifying Large SO_2 Facilities

Ecology identified three facilities in Washington that emitted more than 2,000 tons of SO_2 in 2014: two aluminum smelters, and one coal power plant. The table below lists the three facilities, tons of SO_2 they emitted in 2014, and location of each facility by county where the facilities are.

Table 1. Large SO_2-Emitting Facilities in Washington

Facility Name	2014 SO_2 (Tons)	County
Alcoa Primary Metals Intalco Works	4,794	Whatcom
Alcoa Primary Metals Wenatchee Works	2,935	Chelan / Douglas
TransAlta Centralia Generation, LLC	3,037	Lewis

Intalco Works is located in Whatcom County and Alcoa-Wenatchee Works is located in Chelan County, on the border with Douglas County. Neither aluminum smelter is operating at full production at this time. Intalco Works operated at 75 percent capacity in 2016 and Wenatchee Works has curtailed operations since Dec. 18, 2015, but can restart at any time. Even if the facilities do not operate at full capacity at this time, the SO_2 Data Requirements rule requires characterizing the SO_2 concentrations around these facilities. Ecology and the EPA approved requests from the two aluminum smelters to install new SO_2 ambient air quality monitoring networks around their plants.

The third facility is TransAlta Coal Power Plant located in Lewis County, near the border with Thurston County. The facility has until December 31, 2020, to shut down one of the plant's two coal boilers. The facility plans to shut down the remaining coal boiler no later than December 31, 2025. Ecology chose a modeling approach in order to evaluate levels of SO_2 around the facility.

TransAlta Modeling Results and Attainment Recommendation for Lewis and Thurston Counties

On January 13, 2017, Ecology submitted a modeling report and results to the EPA (Appendix B. Ecology's modeling analysis report submitted to EPA in January 2017). In this report, Ecology described its modeling analysis of the SO_2 levels around the TransAlta Coal Power Plant using the facility's actual emissions reported in 2014-2016 and one year of modeled meteorological

data from the year 2016. The modeled domain includes an area of 50 x 50 kilometers (964 square miles) surrounding TransAlta, and comprises parts of Lewis and Thurston counties.

In the absence of the local meteorological station, Ecology secured one year (2016) of relevant meteorological data from the University of Washington. While this is less than three years of meteorological data requested by EPA, Ecology believes it is adequate in this case. Obtaining additional meteorological data would require significant time and funding investments by Ecology and the University of Washington. The meteorological data from 2016 used in Ecology's modeling analysis is likely to over-estimate SO_2 levels. Nevertheless SO_2 concentrations in ambient air within 50 km (31 miles) of TransAlta's boundary are projected to remain well below the 2010 one hour SO2 NAAQS of 75 parts per billion.

There are no other large sources or clusters of sources emitting large amounts of SO_2 in Lewis and Thurston counties. Per the 2014 National Emissions Inventory, version one, and Ecology's 2014 Comprehensive Inventory, all other sources of SO_2 emissions besides TransAlta, including natural sources, emitted 101 tons of SO_2 in 2014 in Thurston County and 132 tons in Lewis County. These countywide emissions make up less than a tenth of the 2000-ton threshold used for point sources.

Based on the results of the modeling analysis around TransAlta and emissions inventory, Ecology recommends designating Lewis and Thurston counties as being in attainment of the 2010 one hour SO2 NAAQS.

Unclassifiable / Attainment Designation Recommendation

Ecology recommends designating the remaining 34 counties as unclassifiable/attainment. There are no facilities, or cluster of facilities, that emit 2,000 tons or more of SO_2 pollution a year. Due to the drastic reductions in both SO_2 emissions and SO_2 concentrations in the ambient air after 1986, Ecology (with the EPA approval) reduced the extensive SO_2 monitoring network we operated between 1980 and 1990. The three currently operating SO_2 monitoring stations in the 34 counties show SO_2 concentrations that are well below the one-hour standard. For more information and data on reductions in SO_2 emissions, visit the EPA website: https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data.
There are also no identified violations of the standard within the state and along the state borders. It is unlikely that emissions from these counties contribute to violations of the standard in adjacent states.

The EPA often uses the designation category of "unclassifiable/attainment" for areas where appropriate air quality data demonstrating attainment are not available but for which the EPA has reason to believe they are likely in attainment and are not contributing to nearby violations. Based on the emissions inventory data and available limited monitoring data, Ecology asserts that these 34 counties are likely attaining the standard.

The table below summarizes Washington State designation recommendation:

Table 2. Designation Recommendations, By County

Washington State Counties – Designation Recommendations					
Attainment	**Attainment / Unclassifiable**				**No recommendation**
Lewis Thurston	Adams Asotin Benton Clallam Clark Columbia Cowlitz Ferry Franklin	Garfield Grant Grays Harbor Island Jefferson King Kitsap Kittitas Klickitat	Lincoln Mason Okanogan Pacific Pend Oreille Pierce San Juan Skagit Skamania	Snohomish Spokane Stevens Wahkiakum Walla Walla Whatcom Whitman Yakima	Chelan Douglas Whatcom

Next Steps

The EPA will consider Ecology's recommendation and review the relevant air quality data. The EPA will notify the Governor if it agrees with or modifies the state's recommendation. Ecology will have an opportunity to respond to the EPA's proposal and submit new information or justification, if appropriate. The EPA will also offer an opportunity for the public to weigh in on its proposed designation through a public comment period. By terms of the Consent Decree discussed above, the EPA must issue final designations for these areas by December 31, 2017. Once one year passes after the EPA designates areas as attainment or unclassifiable, the older and less protective annual and 24-hour SO2 ambient air quality standards will no longer apply in those areas. Please see WAC 173-476-130 and 40 C. F.R. 50.17 for additional details about this "sunset provision".

Ecology will continue regular evaluations of the air quality for SO2 compliance in all areas of the state. By July 1, 2018, Ecology will review any changes in emissions at TransAlta and determine if we need to conduct additional modeling to ensure the area continues to meet the standard. The EPA may waive this requirement as long as the facility complies with the existing permit limit stays.

Appendices

Appendix A. 2011 Area Designation Recommendation Letter

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

June 2, 2011

Mr. Dennis J. McLerran
Regional Administrator
U. S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900
Seattle WA, 98101-3140

RE: National Ambient Air Quality Standard for Sulfur Dioxide – WA State Designations

Dear Mr. McLerran:

Thank you for your April 4, 2011, letter requesting submission of the state of Washington's recommended designations for the new primary National Ambient Air Quality Standard (NAAQS) for Sulfur Dioxide (SO_2) by June 3, 2011.

On June 3, 2010, the EPA Administrator signed the final rule establishing a new 1-hour primary SO_2 NAAQS of 75 parts per billion (ppb) to protect public health. The rule was published in the Federal Register on June 22, 2010 (75 FR 35520). The Clean Air Act provides each state with an opportunity to recommend designations of attainment (meets the NAAQS), nonattainment (does not meet the NAAQS), or unclassifiable (insufficient information) for all areas of the state.

The Director of the Washington State Department of Ecology has been designated by the Governor with responsibility for the state implementation plan under the Clean Air Act. As the designee of the Governor, I recommend that the entire state of Washington be designated unclassifiable. The state of Washington does not have any ambient monitoring data and air quality modeling analysis that can serve as a basis for designations.

If you have questions about the recommendation, please contact Doug Schneider of my staff at (360) 407-6874 or doug.schneider@ecy.wa.gov.

Sincerely,

Ted Sturdevant
Director

cc: Steve Body, Region 10 EPA
Stu Clark – Ecology, Air Quality Program Manager
Laurie Hulse-Moyer – Ecology, Air Quality Program
Julie Oliver – Ecology, Air Quality Program
Mike Ragan – Ecology, Air Quality Program
Doug Schneider – Ecology, Air Quality Program
Washington Air Quality Managers Group

Appendix B. Ecology's modeling analysis report submitted to EPA in January 2017

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
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January 13, 2017

Janis Hastings, Associate Director
U.S. EPA Region 10
Office of Air, Waste and Toxics
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

RE: Results of the modeling analysis of the levels of sulfur oxides (SO_2) in the ambient air around TransAlta Centralia Power Plant; status of area designation recommendations.

Dear Ms. Hastings:

In July 2016, Washington State Department of Ecology (Ecology) notified the Environmental Protection Agency (EPA) that Ecology plans to model SO_2 concentrations in the ambient air around TransAlta Centralia Generation, LLC (FIPS 53041). EPA requires this modeling under the 2015 Data Requirements Rule for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard. This modeling serves as a basis for EPA to designate the area as attainment (meeting the standard), nonattainment (not meeting the standard), or unclassifiable (not enough information) by December 31, 2017.

Ecology modeled TransAlta's 2014-2016 actual emissions using the WRF- MMIF v3.2-AERMET- ADJ_U*- AERMOD (v16216) system. Ecology's modeling analysis shows the SO_2 concentrations around the facility are well below the 75 parts per billion level of the standard. The attached report details Ecology's modelling process and results.

On July 22, 2016, EPA issued a memo providing information on the schedule and process for the area designations, referred to as Round 3. In Washington, this round applies to all areas of the state except two areas where Ecology established a new SO_2 monitoring network. In 2011, Ecology recommended designating all areas of the state as unclassifiable. Ecology will review the need to modify the earlier recommendation based on the results of the modeling analysis at TransAlta. If appropriate, Ecology will submit an updated designation recommendation to EPA by March 31, 2017, after a state-required public comment period (per WAC 173-400-171(12)).

If you have any questions about this letter, please contact Anya Caudill at Anya.Caudill@ecy.wa.gov or (360) 407-6630.

Sincerely,

Stuart A. Clark, Manager
Air Quality Program

Enclosure: *Technical Report "Air Quality Modeling Results: Levels of Sulfur Dioxide in the Ambient Air Around TransAlta Centralia Generation Power Plant"*

cc Debra Suzuki, EPA Region 10 (w/ enclosure)
Uri Papish, Southwest Clean Air Agency (w/ enclosure)
David Nicol, TransAlta Centralia Generations LLC (w/ enclosure)
Anya Caudill, Ecology (w/ enclosure, for records file)

Air Quality Modeling Results: Levels of Sulfur Dioxide in the Ambient Air Around TransAlta Centralia Generation Power Plant

Technical Report

Prepared By:
Ranil Dhammapala
Air Quality Program
Washington State Department of Ecology

January, 2017

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Introduction

In 2010, the Environmental Protection Agency (EPA) established a new federal 1-hour average National Ambient Air Quality Standard (NAAQS) for sulfur dioxides (SO_2). In 2015, EPA issued the SO_2 NAAQS Data Requirements Rule defining how states should evaluate levels of SO_2 in the ambient air around large industrial facilities or cluster of facilities. The results of the evaluation serve as a basis for EPA to designate each area as attainment (meeting the standard), nonattainment (not meeting the standard) or unclassifiable (not enough data to determine air quality status in the area). The rule offered a choice of three approaches: monitoring, modeling, or establishing a permit limit for the facility to not to exceed 2,000 short tons of SO_2 per year. Under the 2015 rule, EPA required states to submit results of the modeling analysis by January 13, 2017. A state may also recommend to EPA on how to designate the area based on the results of the evaluation.

The Washington State Department of Ecology (Ecology) identified TransAlta Centralia Generation Power Plant (TA), located at 913 Big Hanaford Road, Centralia, WA, as a facility that emitted more than 2,000 tons of SO_2 in 2015. Ecology selected air quality modeling as the tool to further characterize SO_2 levels around TransAlta. The 2015 rule specifies that states can model the most recent actual SO_2 emissions, or the maximum allowable emissions at the facility. Ecology, in consultation with the Southwest Clean Air Agency (SWCAA), elected to model air quality impacts based on the actual emissions rate.

Ecology's modeling analysis shows the SO_2 concentrations around the facility are well below the 75 parts per billion level of the standard. This document details the procedures, inputs and results of SO_2 modeling conducted at TA.

Figure 1: Google Street view of TransAlta- Centralia coal power plant, looking west

Modeling Analysis

After experimenting with AERSCREEN and AERMOD v15181, Ecology chose AERMOD v16216 to provide a more refined analysis of SO_2 impacts, given the two identical 143m tall and 9.1m diameter stacks and complex terrain surrounding the TA facility. Figures 1 and 2 show the facility location.

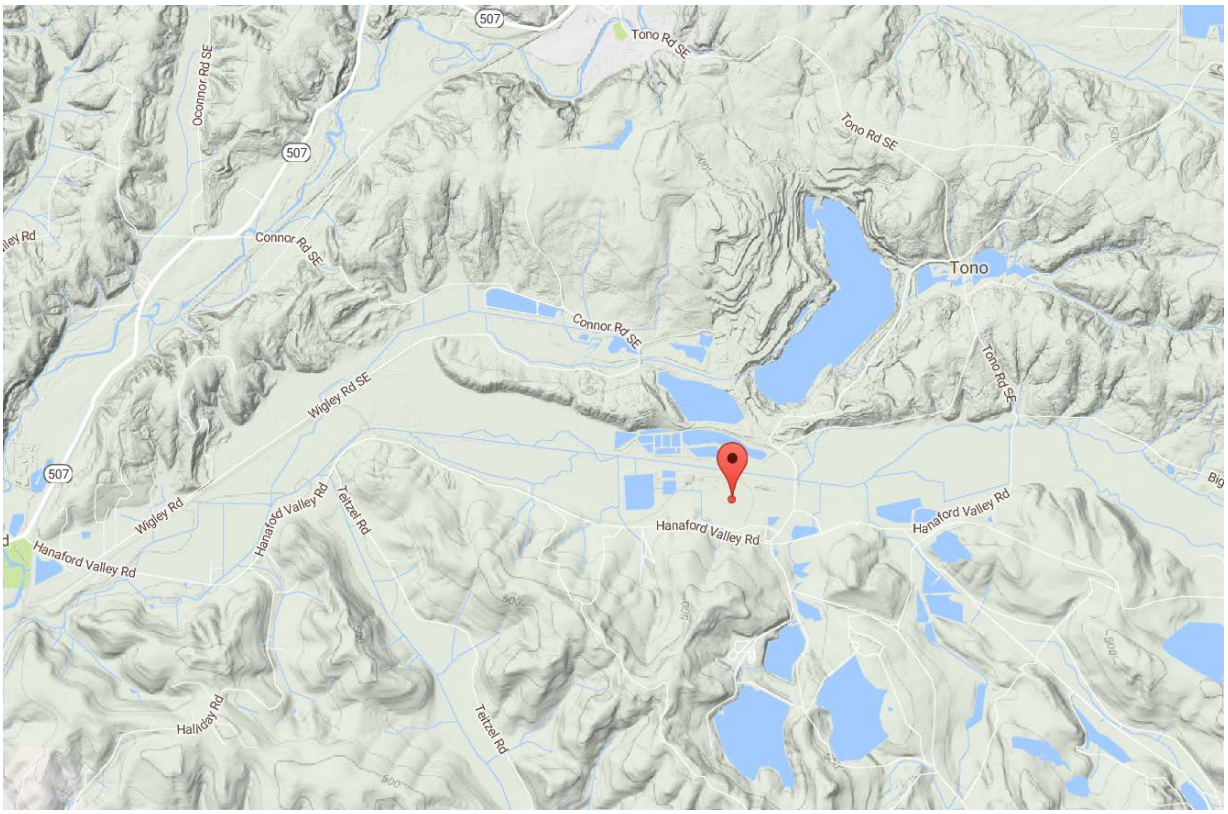

Figure 2: Google Terrain map of TransAlta- Centralia coal power plant

Meteorological Inputs

One year of meteorological data were collected on-site in 1994/ 1995, but the sensor was at 10m above ground level (AGL). Its windrose shown in Figure 3 is reasonably consistent with the valley terrain shown in Figure 2. However, no representative meteorological monitoring site nearby could characterize wind flows at the pollutant release height of 143m. As an alternative, Ecology obtained high resolution meteorological data produced by a mesoscale prognostic model. The University of Washington's Department of Atmospheric Sciences runs the Weather Research and Forecasting (WRF) model at a spatial resolution of 1.33km on a twice- daily basis. The configuration and performance of the UW- WRF system is described elsewhere[1,2]. Observational nudging was not used since UW-WRF ran in forecast mode. The model configuration did not remain static[3] over the time period considered here.

[1] http://www.atmos.washington.edu/wrfrt/info.html
[2] http://www.atmos.washington.edu/~qcreport/verification_index.psp?page=documentation
[3] http://www.atmos.washington.edu/mm5rt/log.html

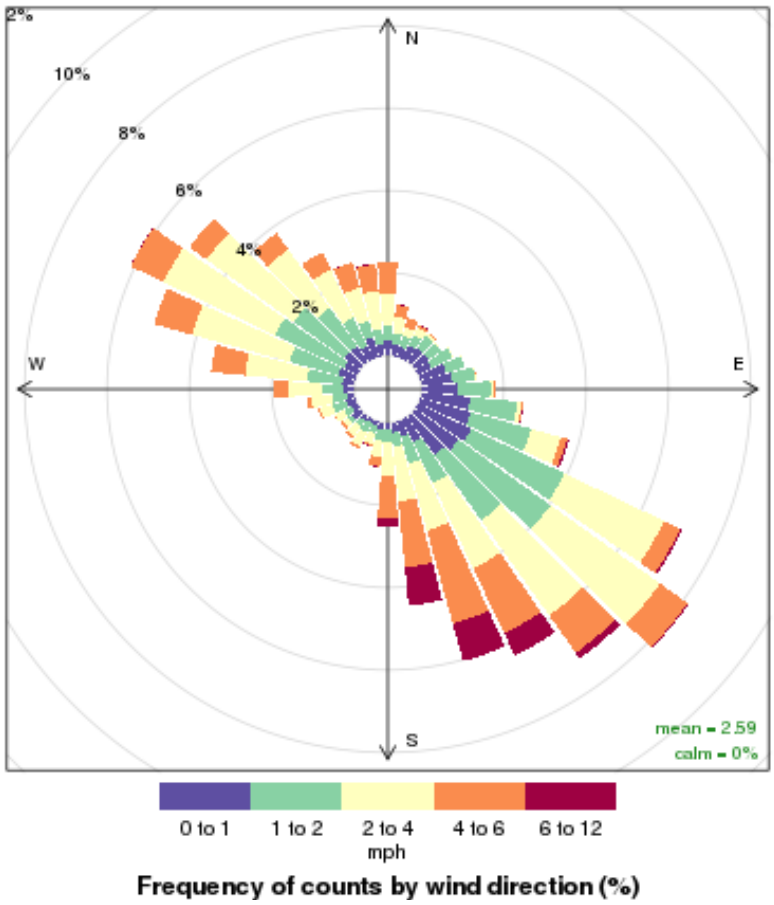

Figure 3: Windrose of 10m on-site data collected from April 1994- April 1995

Initially, Ecology located WRF files from 1 January 2014- 10 September 2016 (almost 2¾ years) and configured EPA's Mesoscale Model Interface Program (MMIF) v3.2 to produce the .SFC and .PFL files for direct use in AERMOD. However, it was brought to our attention that this was not the preferred MMIF configuration for regulatory applications. When we attempted to re-run MMIF and subsequently AERMET, the UW-WRF archive files were no longer easily accessible and we were only able to obtain one year of WRFOUT files. Since the initial MMIF-AERMOD modeling showed 2016 to have higher concentrations than 2014 and 2015, we opted to acquire the 2016 1.33km UW-WRF data in order to remain conservative in our analysis.

We ran MMIF to produce inputs to AERMET, with the PBL_RECALC parameter set to True. Mixing height calculations from WRF can be inaccurate since the PBL parameterization scheme assigns mixing heights to discrete UW-WRF vertical levels. Setting PBL_RECALC to true allows for PBL heights to be re-diagnosed and not constrained to UW-WRF levels. The PFL file contained 11 vertical levels, (2m, 10m, followed by nine levels interpolated using the tops of the following UW- WRF layers: 20, 40, 80, 160, 320, 640, 1200, 2000, 3000 and 4000m). MMIF was run on UW servers due to the large size of the WRFOUT files.

Ecology made some adjustments to the Stage 1, 2 and 3 AERMET input files produced by MMIF:

MMIF extracts vertical temperature differences but not cloud cover data from WRF. Therefore it is preferred if AERMET is supplied with cloud cover data from an observational site to properly process all the MMIF outputs. We obtained 2016 cloud cover data from the National Weather Service site at Centralia Airport (KCLS, about 15km from TA). We amended the Stage 1 and 2 input files to read and quality-check KCLS cloud cover data. Other parameters from the KCLS site were disregarded.

The METPREP section of the Stage 3 AERMET input file was supplied with the "METHOD REFLEVEL SUBNWS" option to process substituted KCLS cloud data. Further the "METHOD STABLEBL ADJ_U*" option was used to adjust anomalously low friction velocities during stable periods, thereby reducing model over-predictions. The ADJ_U* option is justified in this modeling application since it involves a tall stack situated in complex terrain. Terrain higher than the stack height is located >7km from the source.

The surface characteristics around the pseudo- on-site meteorological tower (which WRF- MMIF emulates) are derived from WRF rather than actual conditions. As such AERMET used MMIF's AERSURFACE output file.

The 10m windrose produced by WRF- MMIF- AERMET (Figure 4) is not completely inconsistent with the 1994/ 1995 on- site windrose shown in Figure 3; WRF might have smoothed out or mis-located localized terrain slightly, causing the shift from southeast to south surface winds. The upper levels mimic the typical southwest flow aloft. As such, we deemed the WRF- MMIF- AERMET meteorological data adequately representative of the area for this application.

When only one year of meteorological data are available, the SO_2 modeling Technical Assistance Document allows the .SFC and .PFL files to be replicated over three years, so design values can be calculated by running the model with actual emissions data. We altered the year in both files and the Julian date in the SFC file accordingly, to facilitate this.

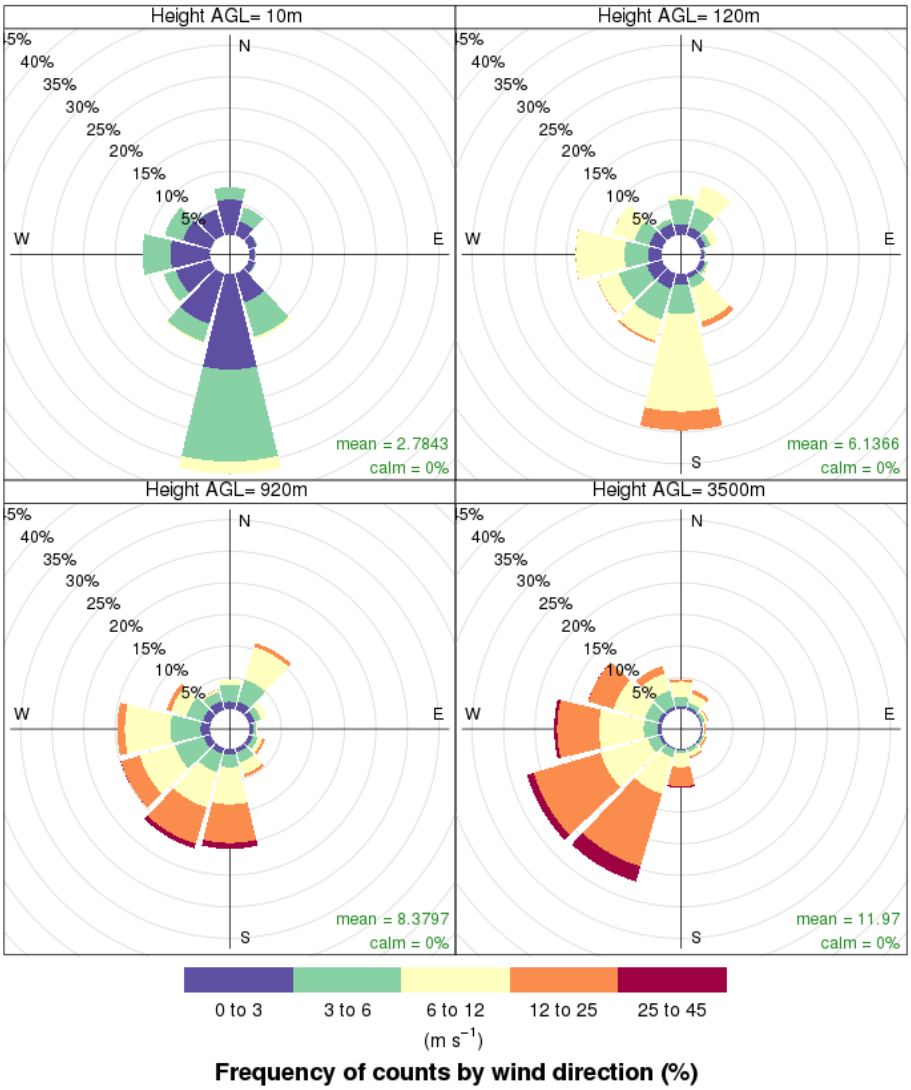

Figure 4: 2016 windroses at different heights over TransAlta, produced by 1.33km WRF- MMIF-AERMET

Emissions and Stack Parameters

Ecology used actual 2014- 2016 SO_2 hourly emission rates reported by the facility to EPA's Clean Air Markets Division database[4]. As emissions from the final quarter of 2016 were not yet uploaded, they were obtained directly from SWCAA. SWCAA also supplied us with hourly stack exit flowrates and temperatures for both emission units. SO_2 emissions from each of the 26,304 hours were modeled as-is: even unreasonably high rates characteristic of plant malfunction or large values substituted by the CAMD quality checks were nevertheless retained. Data substitution was conducted as follows, to ensure valid stack parameters were available for each of the hours modeled:

1. If $SO_2 > 0$, retain valid, non-zero stack exit velocities and temperatures. To minimize plume rise and remain conservative in our analysis, we used the lowest temperature and exit velocity reported by the two stacks, during that hour.

[4] https://ampd.epa.gov/ampd/

2. Non-zero stack temperatures had a lower and upper decile of 50ºC and 59ºC respectively. 50ºC was substituted when non-zero emissions rates were present and temperatures were absent.
3. Stack flowrates (and thus, exit velocities) are linearly related to plant operating load. We developed quarterly relationships using stack- specific flow data over the last 3 years and selected the smallest regression coefficients from all 8 linear fits, even though the respective slope and intercept applied to different stacks/ quarters. Missing exit velocities were filled in using this linear model, which keeps plume rise to a minimum.

Due to the tall stack that easily escapes downwash, this modeling disregarded on- site buildings.

The plant does not operate during some spring months due to low power demand. Figure 5 shows how the emissions and stack parameters change with time, and 6 shows the diurnal and seasonal fluctuations in emissions. Lower emissions during nighttime hours are clearly seen in Figure 6.

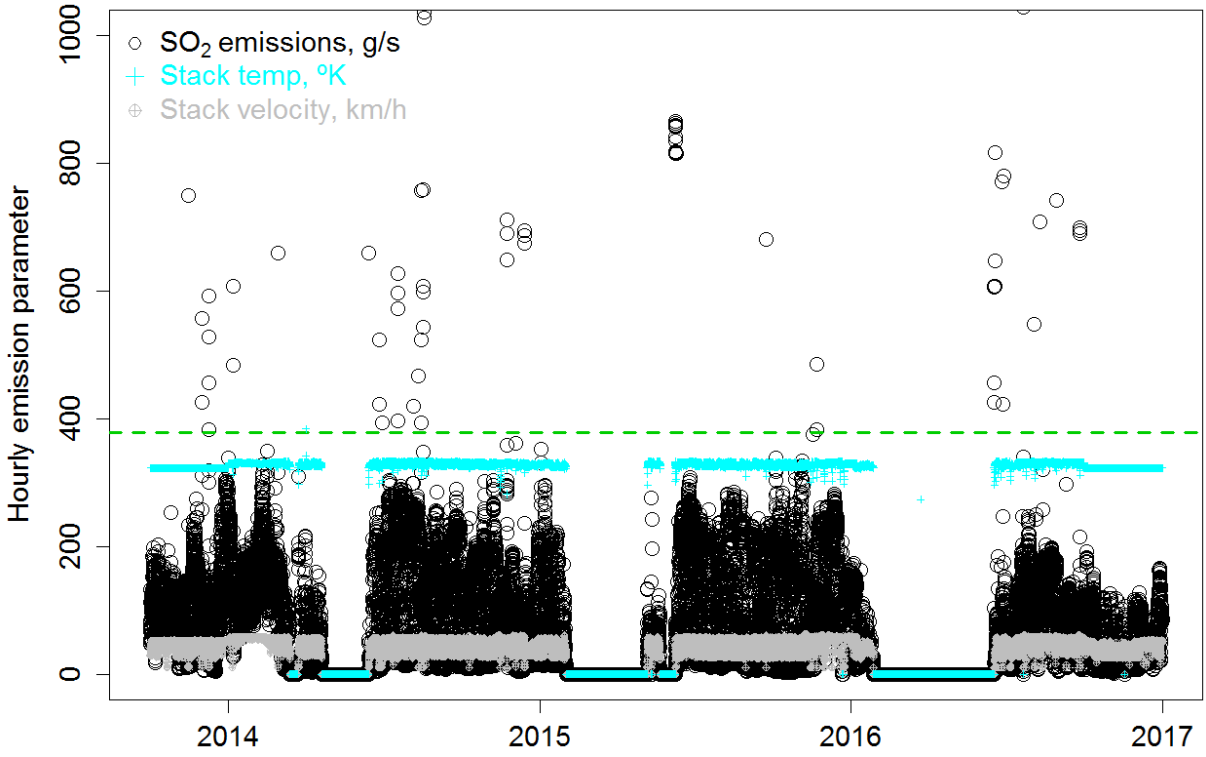

Figure 5: Hourly time series of TA stack parameters. Emissions above the dashed horizontal green line (3000 lb/hr), although retained in this analysis, are considered unreasonably high.

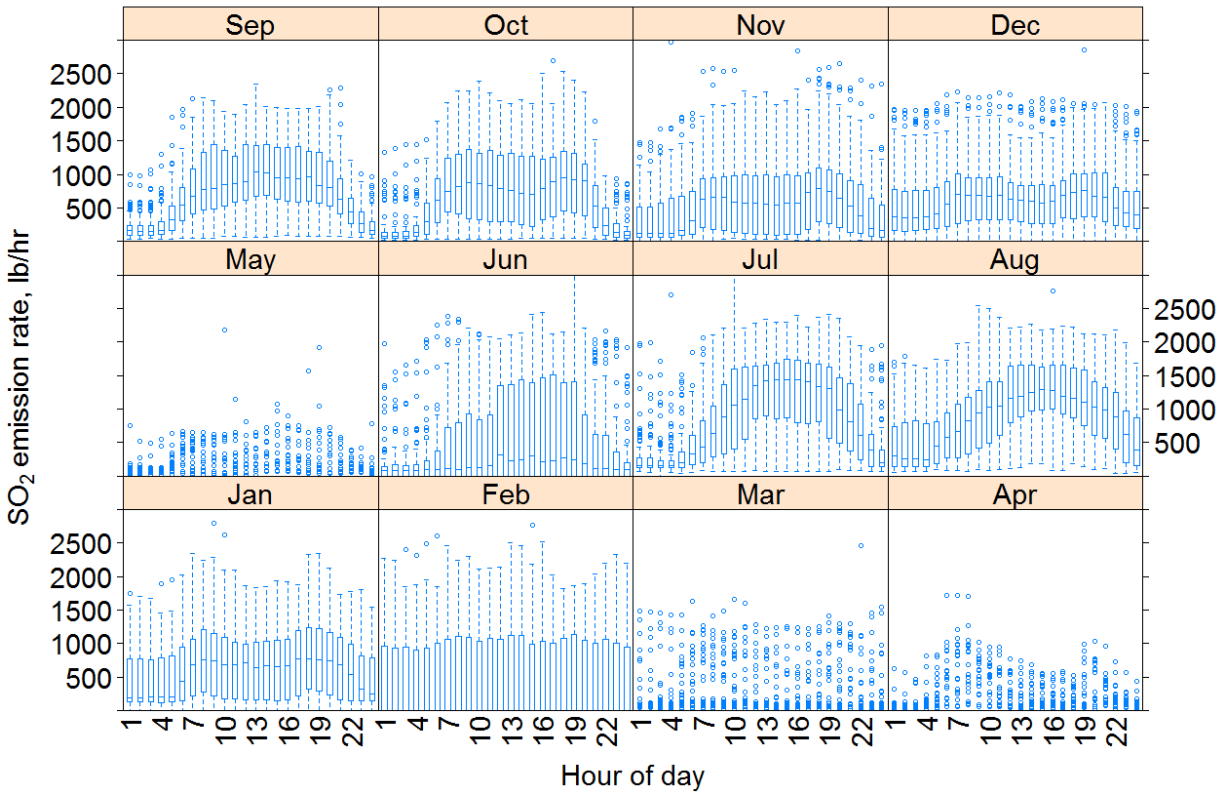

Figure 6: Boxplots of hourly TA SO_2 emission rates from 2014- 2016

Nearby Sources and Background SO_2 Concentrations

In an attempt to determine the significance of nearby sources, Ecology initially conducted AERSCREEN modeling using the 99th percentile of the actual 2014 emissions (2150 lb/hr). The model assumed flat terrain. Ecology also modeled SO_2 emissions from Cardinal Glass (46.6 tons/ yr, 25km to the southwest of TA). Cardinal Glass had a maximum impact less than 5 µg/m^3. This is much smaller than SO_2 from TA, even when TA's concentrations were potentially under-estimated by setting the land cover to "forested" (Figure 6). SO_2 sources in Longview and the Tacoma Tideflats are more than 50 km away and emit less than 10 tons of SO_2 annually. Therefore the regional background SO_2 concentration of 13 µg/m^3, obtained from http://www.lar.wsu.edu/nw-airquest/lookup.html, very likely accounts for all nearby SO_2 sources.

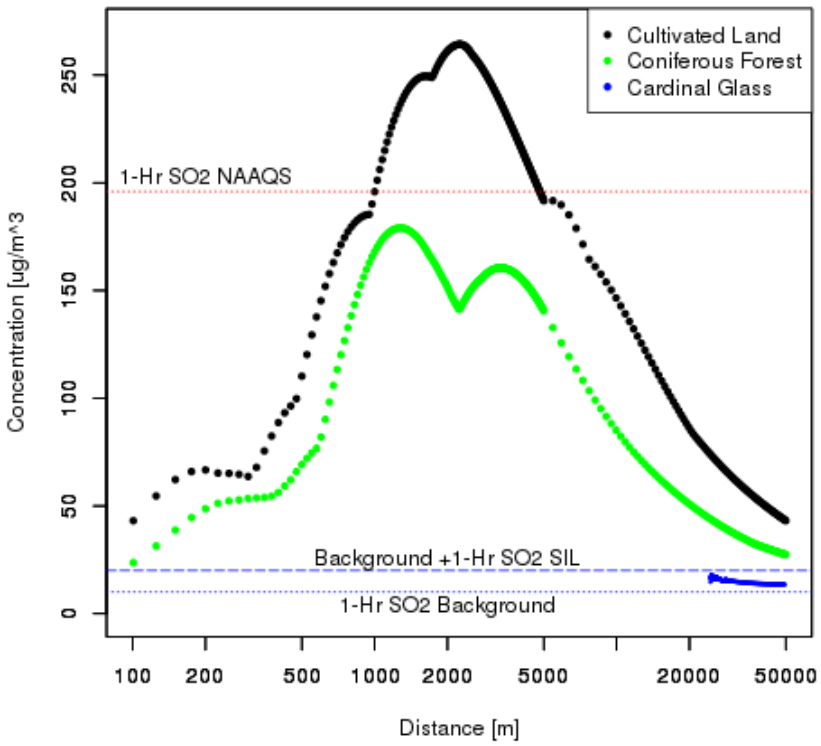

Figure 7: AERSCREEN results for TransAlta and Cardinal Glass SO_2

Modeling Domain

Since Figure 7 shows high concentrations occurring within 20km of the source, we approximately centered a 200m- spaced grid over a 50 km by 50 km domain on the TA facility (i.e. extending about 28km east of TA). AERMAP v11103 was used to process terrain data for a total of 62001 flagpole receptors 1.4m above ground level. We obtained the underlying 1/3 arc second terrain data with NLCD 2011 land cover, from MRLC[5]. Figure 8 shows the modeling domain and results.

AERMOD Results

Ecology added the 3-year average of the 99th percentiles of the highest daily 1-hr SO_2 concentrations at each receptor for 2014-2016, to the static SO_2 background concentration of 13 µg/m³. Figure 8 shows the spatial distribution of model results, inclusive of background. The maximum impacted receptor had an SO_2 design value of 100.7 + 13 = 113.7 µg/m^3, or about 44 ppb. The highest impacts occur within or just outside the property boundary, mostly during a few hours in 2016 when light winds and mildly stable conditions coincided with some combination of high emission rates, low stack temperatures or exit velocities.

[5] http://www.mrlc.gov/viewerjs/

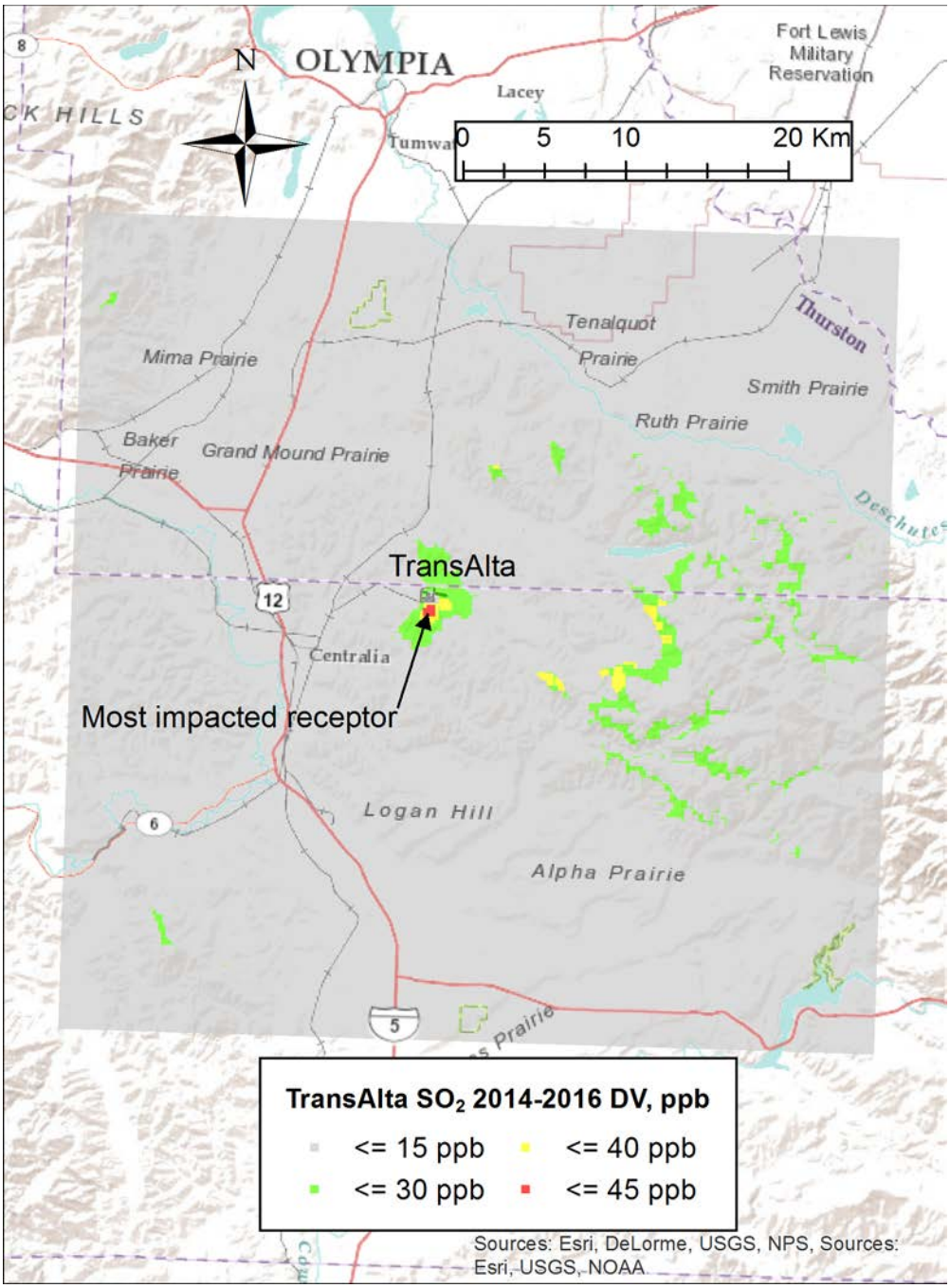

Figure 8: MMIF-AERMET- ADJ_U- AERMOD modeled 2014-2016 SO_2 design values (inclusive of background) around TransAlta.*

Conclusion: SO_2 NAAQS Compliance at TransAlta

Ecology modeled the actual 2014- 2016 SO_2 emissions from TransAlta using the WRF- MMIF v3.2- AERMET- ADJ_U*- AERMOD (v16216) system, making some conservative assumptions. The highest impacted receptor within the 50 x 50km modeling domain is located on elevated terrain about 8km east of the facility, and recorded a 3-year average of the 99th percentile concentration (i.e. design value) of 44 ppb inclusive of background.

This work shows the worst affected receptor is well below the SO_2 standard of 75ppb, confirming that TransAlta's Power Generation facility in Centralia, WA has complied with the 2010 1-hour SO_2 NAAQS.

Electronic files associated with this modeling (except WRFOUT files from the UW) are available on request.